

FIG. 1

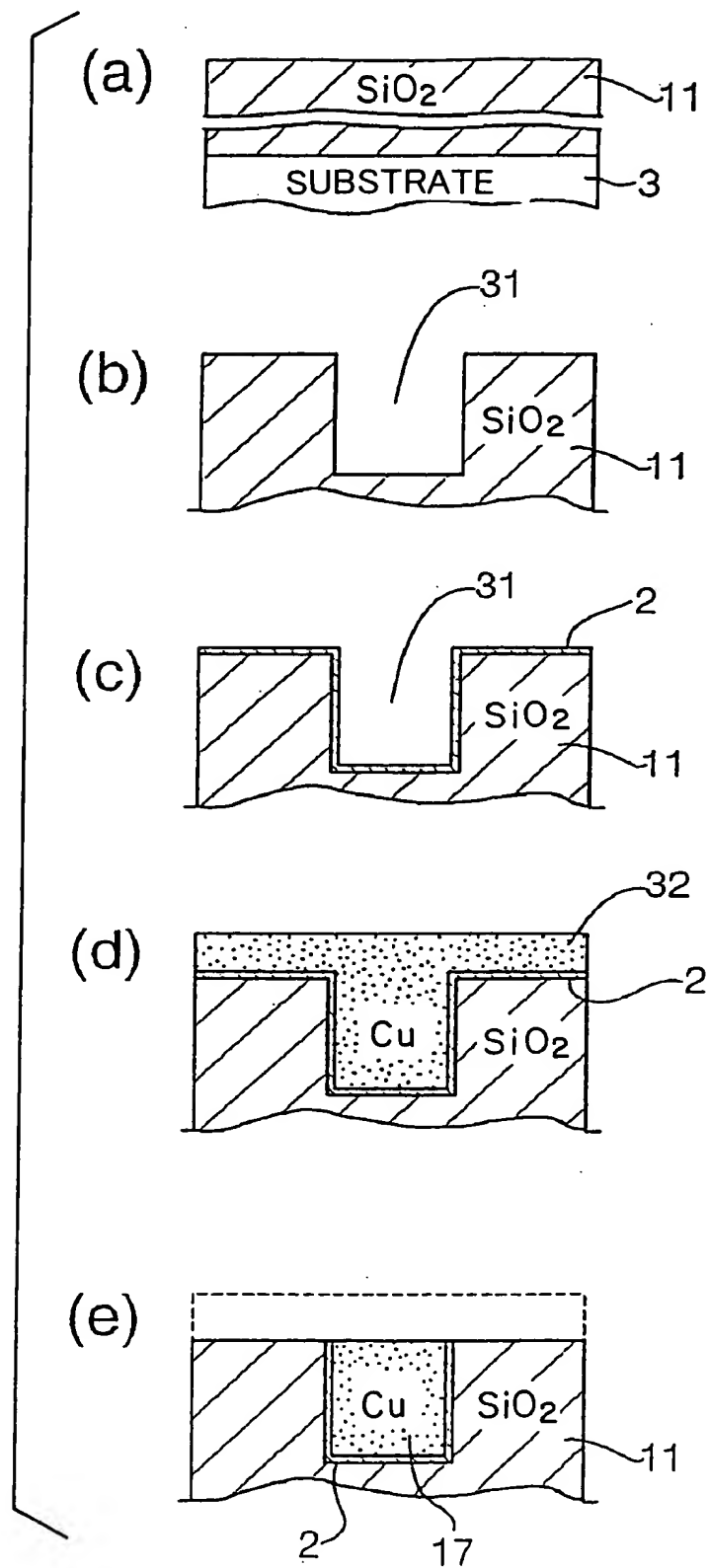
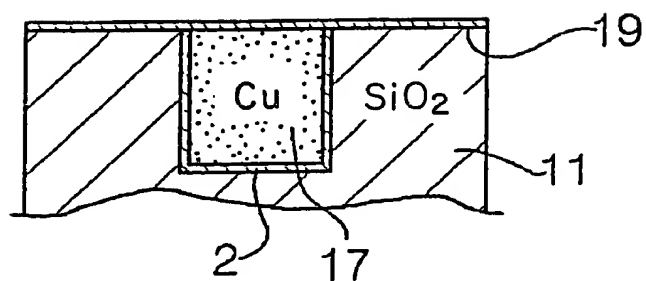
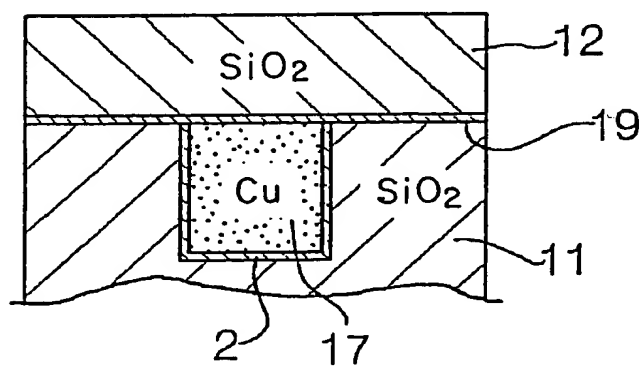


FIG. 2

(a)



(b)



(c)

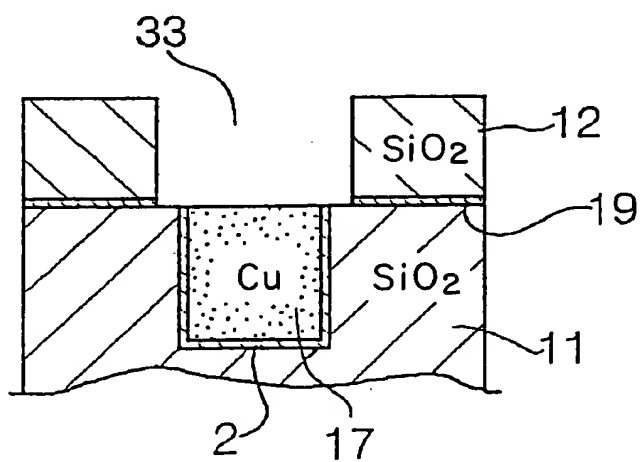


FIG. 3

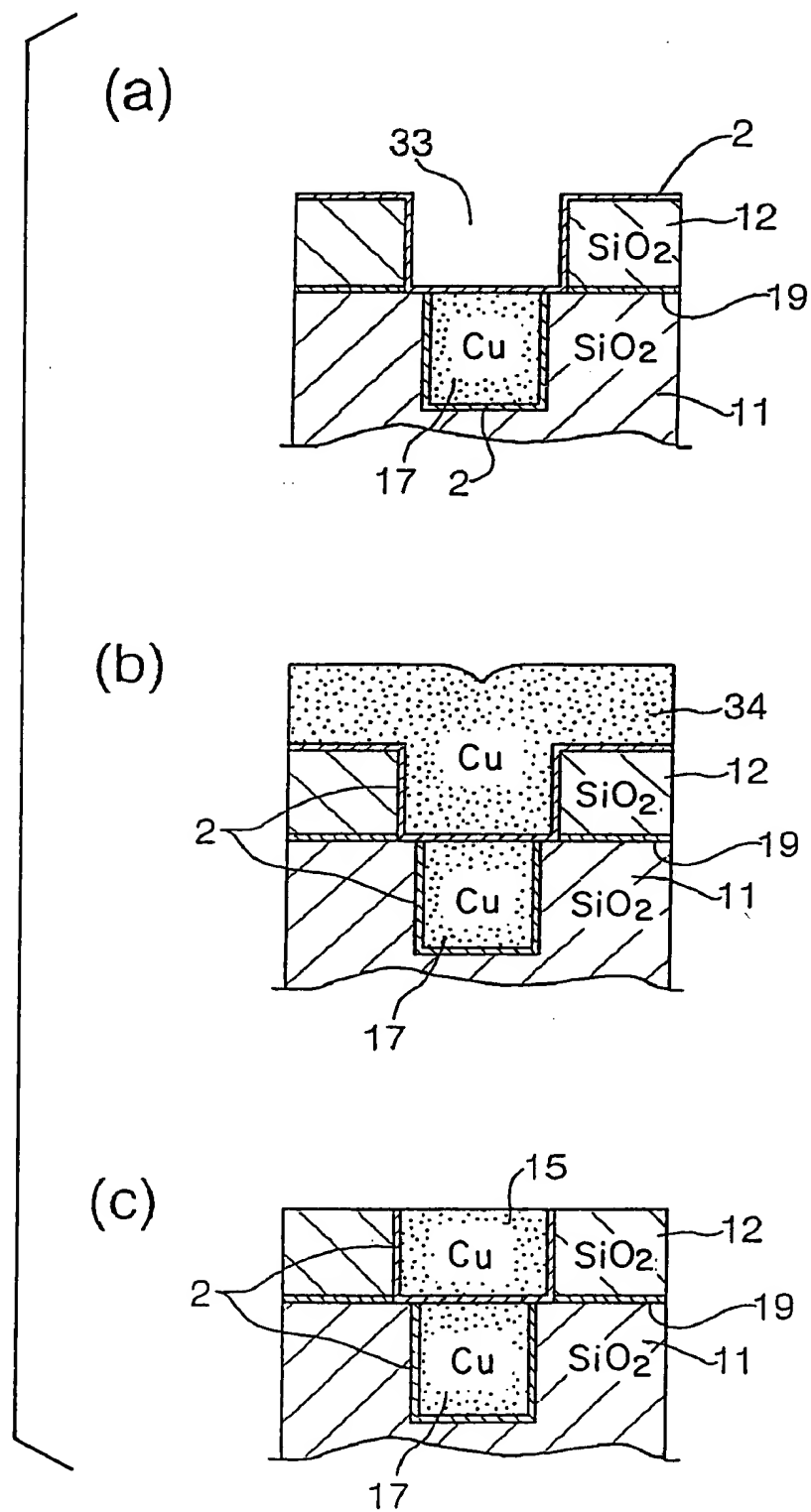


FIG. 4

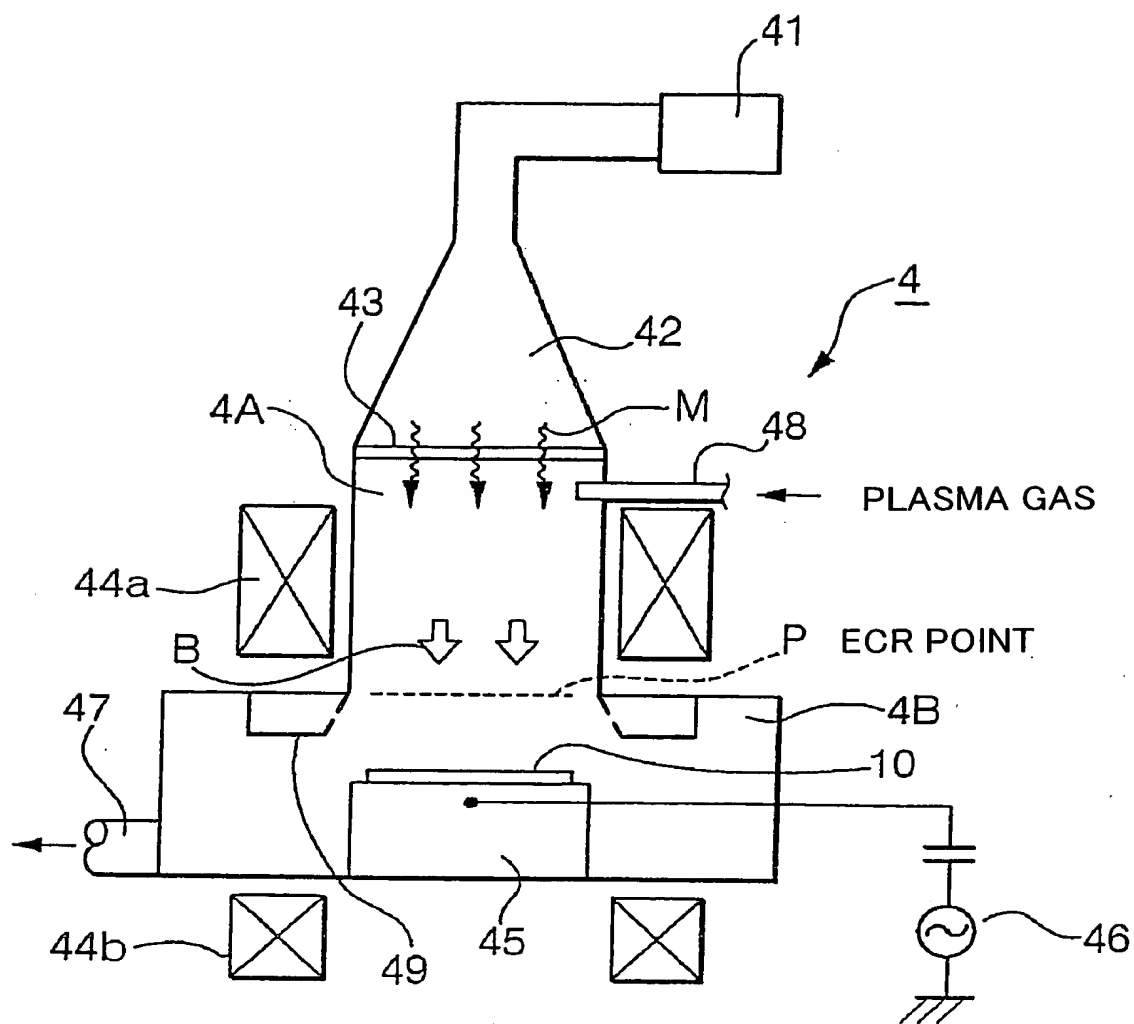


FIG. 5

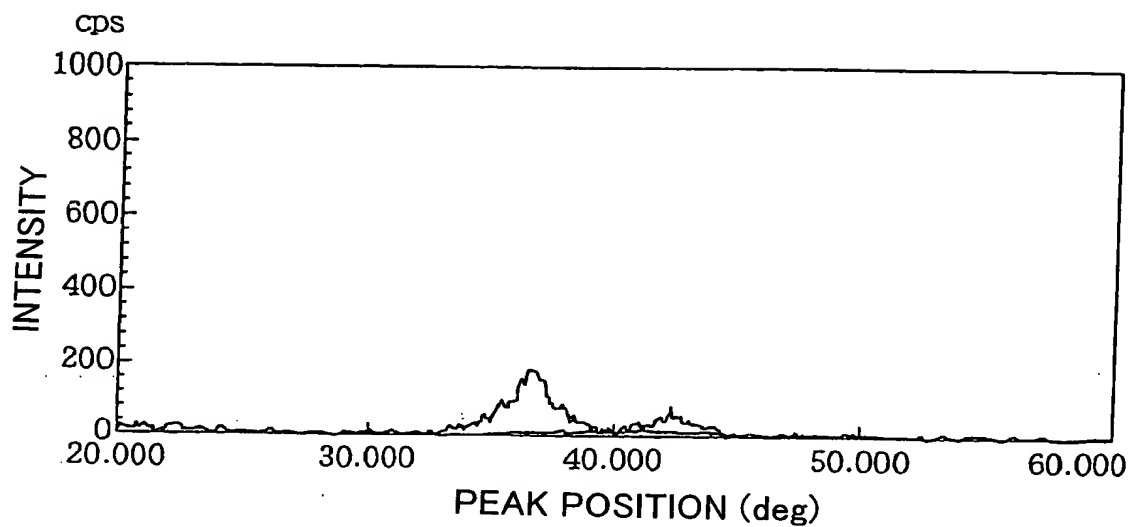


FIG. 6

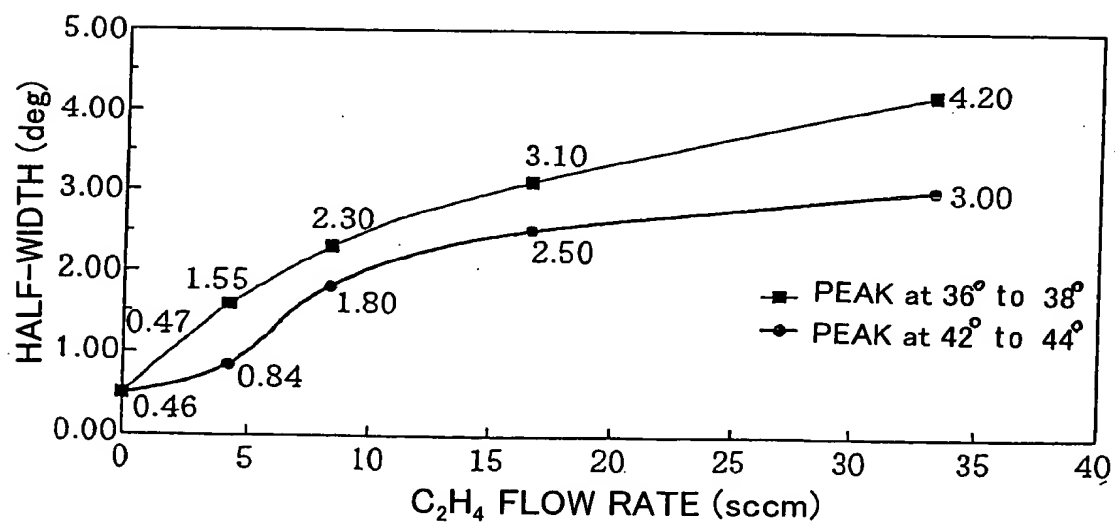


FIG. 7

C ₂ H ₄ FLOW RATE (SCCM)	HALF-WIDTH		BARRIER PROPERTY AGAINST Cu
	FIRST PEAK	SECOND PEAK	
0	0.46	0.47	○
4.2	1.55	0.84	○
8.3	2.30	1.80	○
16.7	3.10	2.50	△
33.3	4.20	3.00	×

FIG. 8

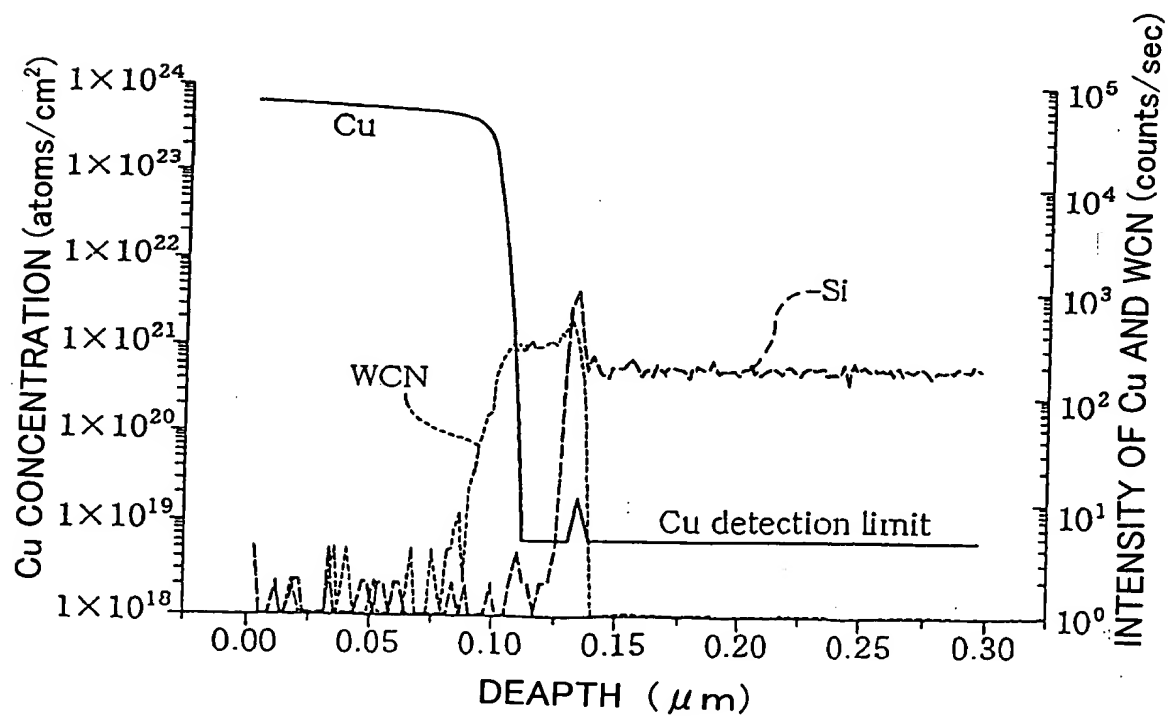
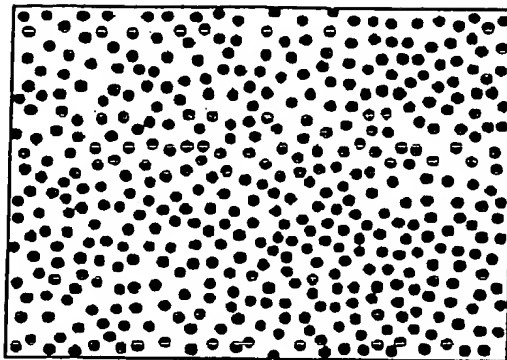


FIG. 9

(a)



(b)



(c)

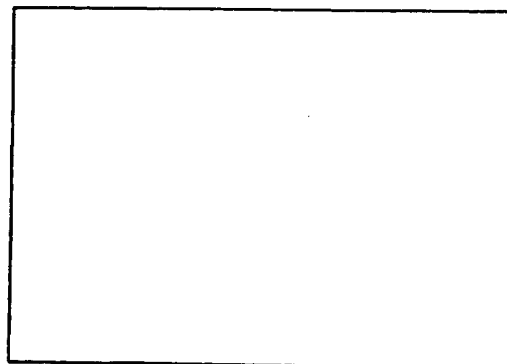


FIG. 10

GAS	HALF-WIDTH		BARRIER PROPERTY AGAINST Cu
	FIRST PEAK	SECOND PEAK	
C ₂ H ₄	2.3	1.8	○
C ₂ H ₆	3.2	2.6	△
C ₂ H ₂	1.9	1.6	○

FIG. 11

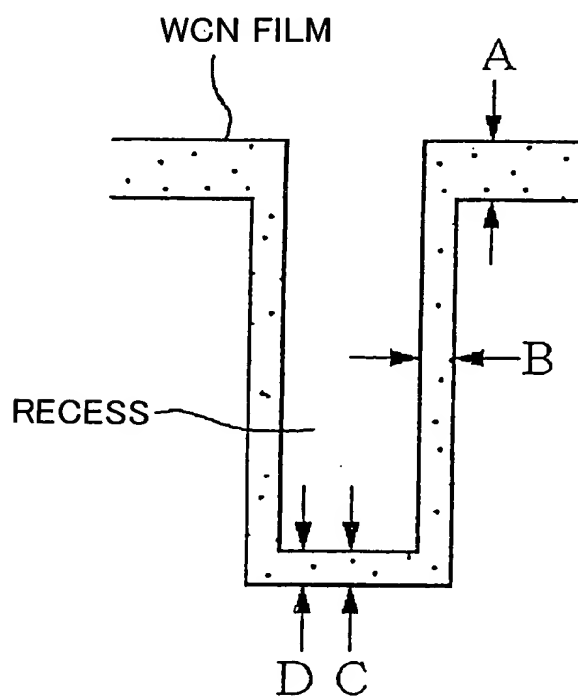


FIG. 12

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	COVERAGE (%)		
	B/A	C/A	D/A
WCN	20	32	28
WN	16	24	20

FIG. 13

	ADHESION STRENGTH (psi)	
	SiO ₂	SiN
WCN	4.5	4.2
WN	2.3	1.8

FIG. 14

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N/W RATIO	C/W RATIO	ADHESION STRENGTH TO SiO ₂ /SiN (kpsi)
0	0	<1/<1
0	0.48	5.0/4.7
0	0.79	6.2/5.1
0	0.98	5.4/3.7
0	1.23	5.4/4.2
0.48	0	2.3/1.8
0.49	0.12	4.0/3.7
0.47	0.24	4.5/4.2
0.42	0.34	6.2/5.2
0.4	0.54	4.2/3.9
0.39	0.75	5.1/4.2
0.32	0.98	6.1/3.4
0.79	0	2.1/1.2
0.78	0.3	2.8/1.8
0.74	0.41	2.1/2.4
0.7	0.62	2.6/2.0

FIG. 15

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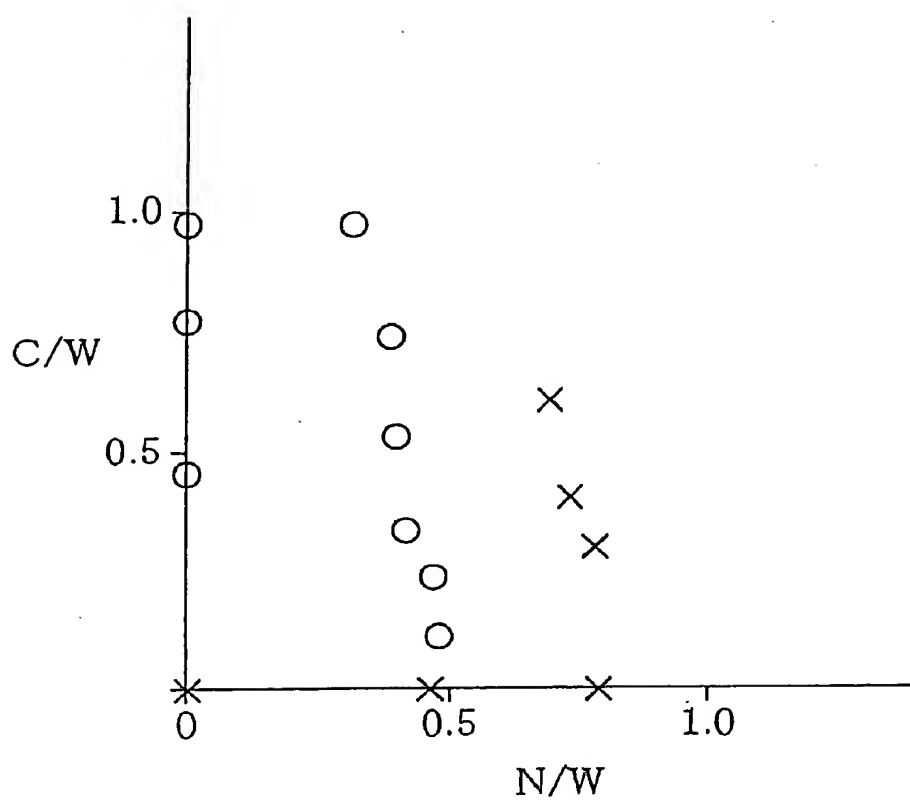


FIG. 16

CF ₄	A	B	C	D
0sccm	100%	16%	24%	20%
4.2sccm	100%	23%	36%	30%
8.3sccm	100%	27%	40%	34%
16.7sccm	100%	32%	45%	38%
C ₂ H ₄				
8.3sccm	100%	20%	32%	28%

FIG. 17

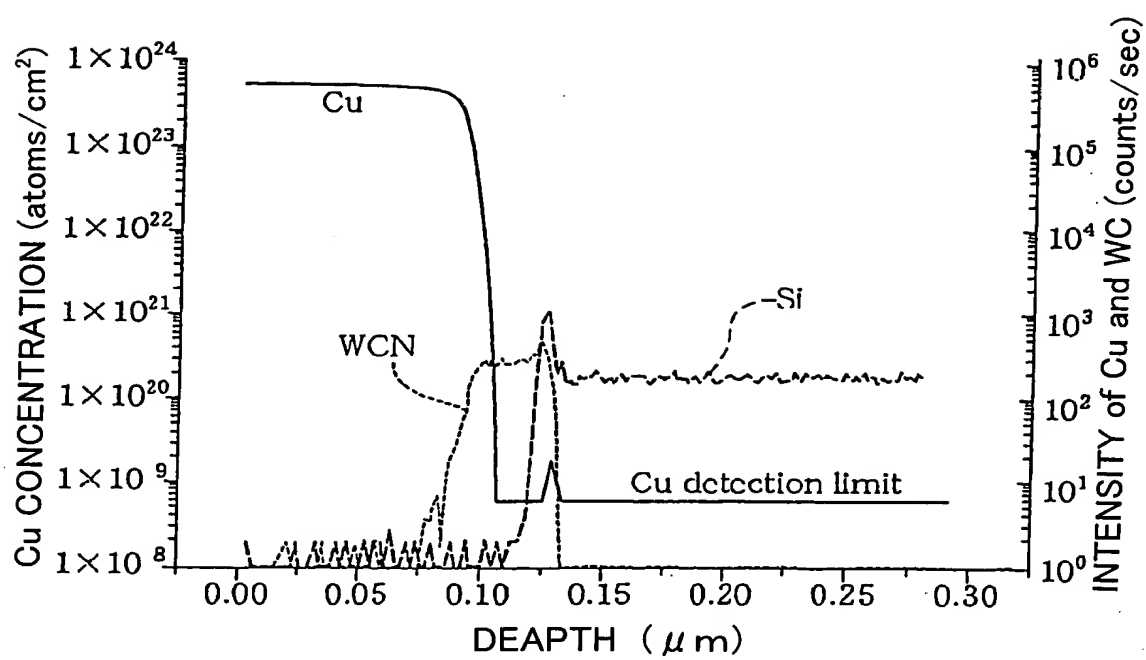


FIG. 18

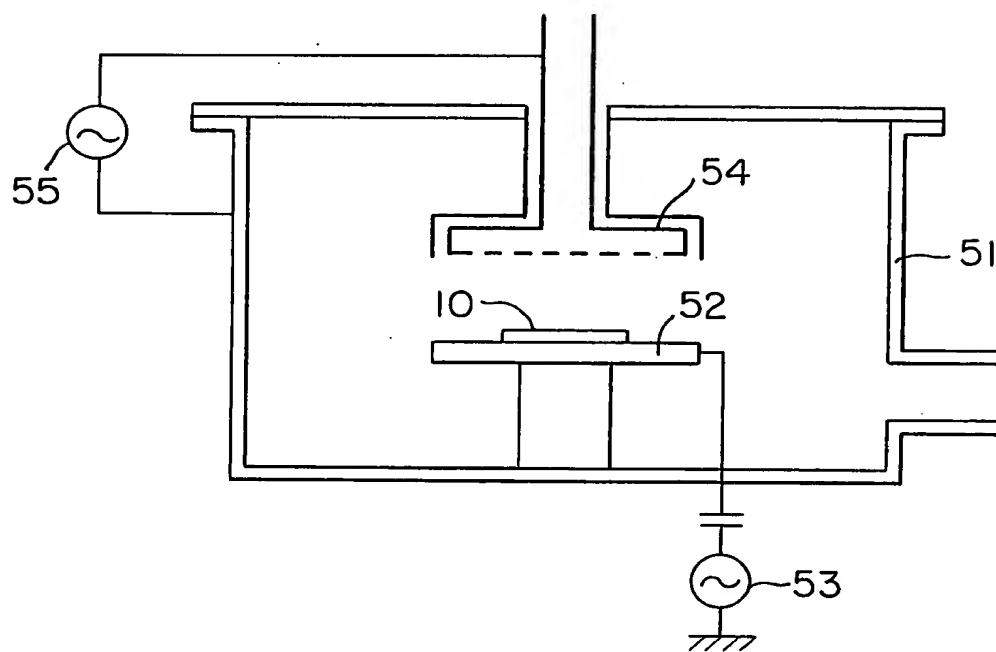


FIG. 19

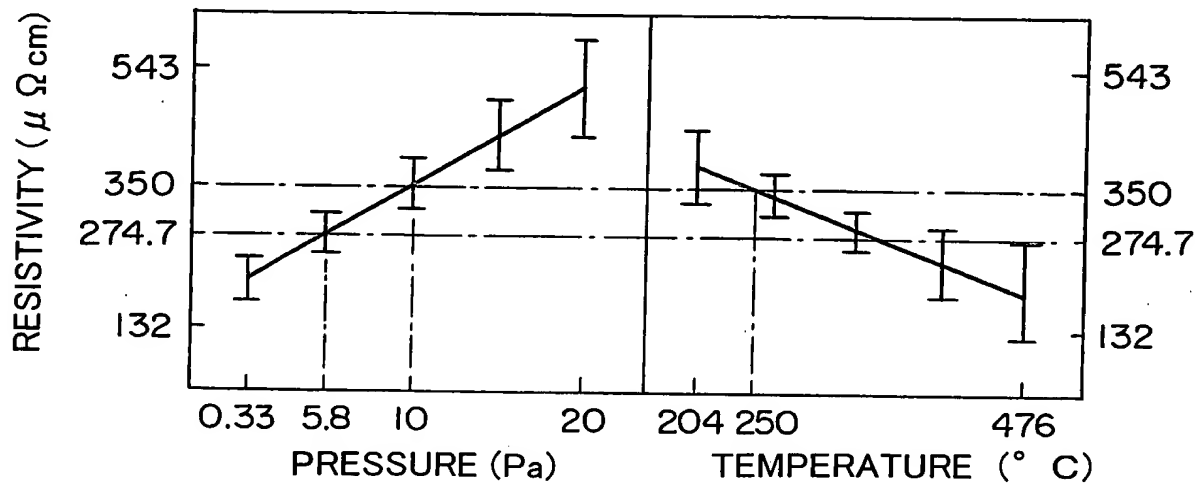


FIG. 20

RESISTIVITY ($\mu \Omega \text{ cm}$)	HALF-WIDTH	
	FIRST PEAK	SECOND PEAK
189	1.62	0.91
275	2.31	1.65
347	3.05	2.39
420	4.02	2.98
491	4.78	3.52

FIG. 21